

## NATURAL RESOURCES CONSERVATION SERVICE

### CONSERVATION PRACTICE STANDARD

#### Mine Shaft and Adit Closing

(Number)

Code 457

#### DEFINITION

Filling underground mines or closing exposed openings.

where periodic inspection and maintenance is ensured through a maintenance agreement with a responsible government entity, landowner, or organization.

#### PURPOSES

- To fill or seal mine shafts and other openings to reduce subsidence problems, hazards to humans and animals, the emission of hazardous gases, and the pollution of surface and ground water
- To close openings for human safety while maintaining access for wildlife species
- To close openings for the protection of cultural resources.

Closure of openings for protection of cultural resources shall meet the requirements of Enclosures and Gates or Designed Filling or Sealing, as appropriate.

Stockpiled soil or rock materials shall be protected from erosion until used.

#### Design References:

Agricultural Engineering Note 1, January 1981, contains guidance on investigation, safety, design, and construction and is to be used as a procedural guide with this standard. Agricultural Engineering Note 1 was developed specifically for coal mines and all information does not apply to other types of mines.

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies to locations where shafts, sinkholes, or adits of underground mines have been left open.

This practice may be associated with surface treatment to reclaim the area surrounding the mine opening.

Guidance for enclosures and gates for bat conservation purposes is found in Bats and Mines by Merlin D. Tuttle and Daniel A.R. Tylor of Bat Conservation International, Inc., 12/94.

#### CRITERIA

##### General criteria applicable to all purposes:

Gates or other closure techniques that optimize bat and other wildlife habitat must be considered where habitat or potential habitat exists. Enclosures, gates, and caps shall be used only

#### Safety:

Teams consisting of a minimum of two persons each are required to conduct searches for concealed shafts and adits, leaving their specific schedule with others. Safety barriers, ropes, safety belts, gas detectors, and other equipment must be used as necessary during site reconnaissance, surveying, and foundation investigation activities.

**Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.**

If hazardous gas is present, safety precautions are to be taken as necessary for the site investigation and practice installation. Only persons experienced and trained in this activity are to provide guidance on measures to be taken.

During construction, a collapse zone shall be established, clearly marked with fencing and warning notices, and no person shall enter this zone without wearing proper safety equipment.

Bumper blocks or other devices must be used to keep machinery and trucks from falling into shafts and subsidence pits. If possible, equipment blades and buckets shall be larger than the opening being filled.

At the completion of the closing, the shaft or adit location shall be marked and recorded to reduce the risk of future development over the shaft or adit.

**Additional Criteria for Enclosures and Gates:**

Enclosures or gates shall be used for the protection of wildlife habitat, such as bat roosting sites or where it is essential to occasionally enter or gain access to shafts or adits.

Enclosures or gates shall be made of steel, concrete, masonry, or “anti intruder” chain link and barbed wire fences or a combination of these materials. Enclosures or gates shall be constructed to keep unauthorized persons out and shall be located where subsidence or caving will not break their integrity.

**Additional Criteria for Designed Filling or Sealing:**

Shafts and adits shall be cleaned of all trash, debris, metal, timber, wire, and other materials that could hinder an effective design filling or sealing.

All materials removed shall be disposed of by burning or burying at approved sites or transported to approved landfills.

**a. Designed filling:**

Shafts or adits shall be filled to about 1.5 m (5 ft.) from the surface with a properly designed

filter consisting of nonacid-forming, free-draining materials.

The remainder of the shaft or adit shall be filled with random fill materials interspersed with layers of clay, approximately 0.6 m (2 ft) thick, or other impervious materials that would retard the passage of water or gas. Shaft openings shall be overfilled 10 percent of the depth of the shaft, or 1.5 m (5 ft), whichever is less to allow for settlement.

The finished surface of the filled shaft or adit shall be graded to provide free drainage away from the opening and vegetation established in accordance with NRCS standards.

Sinkholes that are the result of a mining process and are open, active, and/or passing a significant quantity of water require a properly designed filter of nonacid-forming, free-draining material. Sufficient soil covering shall be placed to sustain planned vegetation.

Sinkholes that are closed, inactive, and not passing a significant quantity of water shall require only backfilling with suitable soil material. The allowance made for settlement shall be 10 percent of the fill depth, and the area shall be overfilled accordingly.

**b. Sealing with Caps:**

Caps are constructed of reinforced concrete or steel beams and grates or solid steel plates to completely close shaft or adit openings.

Caps shall be designed with sufficient strength to support anticipated loads.

The cap and fittings, access holes, and vent pipe shall be reasonably vandal-proof. The surface of a cap over a shaft must be raised not less than 0.3 m (1 ft) above the surrounding terrain to provide good visibility and positive drainage away from the cap installation.

**c. Sealing with Plugs:**

Shafts shall be closed with plugs only if another practical solution is no available. Installed at substantial distances below the ground surface, plugs are used where the shaft is to be filled to

the surface (See “Designed Filling”), but the shaft below is to remain open.

Plugs shall be constructed of reinforced concrete designed to support anticipated loads and shall be placed on firm bedrock. They may be designed to be watertight and gastight or to allow drainage and venting of gasses.

**d. Sealing with Barriers:**

Barriers are constructed to restrict humans and animals from entering adits, and may be used to prevent lateral spreading of backfill material and to support fill used to cover adit openings.

Barriers are constructed of stones, crushed rock, quarry run rock, gravel, shale, or similar nonacid-forming, free-draining materials.

The minimum length of the barrier shall be three times the maximum adit height or width within the barrier section, whichever is greatest.

Concrete or masonry wall may be used to support the barrier. Barriers not supported by concrete or masonry walls shall have 3 horizontal to 1 vertical or flatter slopes.

Barriers at the ground surface shall be covered with soil materials to a minimum vertical thickness of 1.2 m (4 ft.) and vegetation established in accordance with NRCS standards.

If needed, a permanent drainage system using pipe or rock toes shall be installed through this covering. Traps to prevent air or gas passage may be necessary.

**e. Sealing with Dams:**

Dams are constructed to prevent water flow into or out of adits.

Dimensional requirements are those stated for barriers in the previous paragraph.

The fill shall be essentially watertight and designed to support anticipated structural and hydraulic loads.

**CONSIDERATIONS**

No special considerations have been identified for this practice.

**PLANS AND SPECIFICATIONS**

Plans and specifications for closing shafts and adits shall be in keeping with this standard and shall describe the requirements for applying the practice to the specific site to achieve its intended purpose or purposes.

**OPERATION AND MAINTENANCE**

Restrictive barriers, fences, enclosures and caps are to be maintained to accomplish their purpose.

Maintenance is essential because of the strong likelihood of additional subsidence, water drainage, failure of vegetation, vandalism, and other problems associated with mine closures.

Regular inspections must take place and prompt repair and follow-up be carried out. Additional maintenance activities must be outlined in the maintenance plan.